

WHAT IS CLAIMED IS:

1. An optical device for converging a light beam illuminated on an optical recording medium, comprising:

light converging means for converging the light beam illuminated on a recording layer of the optical recording medium; and

a light barrier portion formed on a surface of said light converging means facing said optical recording medium,

    said light barrier portion having a light transmitting aperture for permitting the light beam converged by said light converging means to pass therethrough, wherein the diameter of said light beam illuminated on said optical recording medium is controlled by said light transmitting aperture.

2. The optical device according to claim 1 wherein at least a portion of said light converging means has at least a portion thereof formed by dry etching.

3. The optical device according to claim 1 wherein said light converging means is formed on one surface of a substrate consisted of an optical material and wherein said light barrier portion is formed on an opposite surface of the substrate.

4. The optical device according to claim 1 wherein said light converging means comprises a plural number of lenses arranged on an optical path of said light beam.

5. The optical device according to claim 1 wherein an antireflection film is formed on each surface of said light barrier portion.

6. A method for preparing an optical device for converging a light beam illuminated

on an optical recording medium, said method comprising the steps of:

forming light converging means on one surface of a substrate consisted of an optical material by dry etching;

forming a light barrier film on an opposite side surface of said substrate; and patterning said light barrier film by a photolithographic technique to form a light transmitting aperture for transmitting the light beam converged by said light converging means therethrough.

7. The method for preparing the optical device according to claim 6 wherein a position of forming said light transmitting aperture in said light converging means is adjusted using a double-side photolithographic technique.

8. The method for preparing the optical device according to claim 6 further comprising the steps of:

forming a mask material in correspondence with a shape of an optical lens on said substrate consisted of the optical material and subsequently deforming the mask material by heat treatment so that a surface area of the substrate be reduced; and

transcribing the light converging means shaped in compliance with the shape of said mask material by dry etching on said substrate..

9. The method for preparing the optical device according to claim 8 wherein a temperature of the heat treatment is higher than a glass transition temperature of the mask material and lower than a carbonizing temperature of the mask material.

10. A recording and/or reproducing apparatus for recording and/or reproducing

information signals for an optical recording medium, comprising:

an optical device including:

light converging means for converging a light beam illuminated on a recording layer of the optical recording medium; and

a light barrier portion formed on a surface of said light converging means facing said optical recording medium,

said light barrier portion having a light transmitting aperture for permitting the light beam converged by said light converging means to pass therethrough, wherein a diameter of said light beam illuminated on said optical recording medium is controlled by said light transmitting aperture;

said optical device being used as at least a portion of an optical system.

11. An optical device comprising an optical lens in a portion of light converging means,

said optical lens being formed on dry etching, wherein a position matching marker is formed around said optical lens.

12. The optical device according to claim 11 wherein said light converging means comprises a plural number of lenses arranged on an optical path of a light beam and wherein said lenses is position-matched to one another by a plural number of said position matching markers.

13. A method for preparing an optical device, wherein, when forming an optical lens by dry etching on one surface of a substrate consisted of an optical material, position

matching markers are formed simultaneously around said optical lens.

14. The method for preparing the optical device according to claim 13 further comprising the steps of:

forming said optical lens is formed by dry etching on one surface of said substrate consisted of the optical material;

forming a light barrier film serving as a light barrier portion on an opposite surface of said substrate, wherein

    said light barrier film is patterned by a photolithographic technique to form a light transmitting aperture for transmitting a light beam converged by said light converging means therethrough.

15. The method for preparing the optical device according to claim 14 wherein a position of forming said light transmitting aperture is adjusted using said position matching marker.

16. The method for preparing the optical device according to claim 13 further comprising the steps of:

    forming a mask material in correspondence with a shape of said optical lens on said substrate consisted of the optical material and subsequently deforming the mask material by heat treatment so that a surface area of the mask material is reduced; and

    transcribing the optical lens having a shape conforming to a shape of the mask by dry etching on said substrate.

17. The method for preparing the optical device according to claim 16 wherein a

temperature of heat treatment is higher than a glass transition temperature of the mask material and lower than a carbonizing temperature of the mask material.

18. A recording and/or reproducing apparatus for recording and/or reproducing information signals for an optical recording medium, comprising an optical device including an optical lens formed by dry etching in a portion of light converging means and a position matching marker formed around said optical lens,

    said optical device being used as at least a portion of an optical system.

19. A method for preparing an optical device in which light converging means is formed by dry etching on one surface of a substrate consisted of an optical material, wherein

    a gas mixture of at least one selected from the group of an oxygen gas, an Ar gas and a He gas and a fluorinated carbon gas is used as an etching gas.

20. The method for preparing the optical device according to claim 19 comprising the steps of:

    forming a mask material in correspondence with a shape of an optical lens on said substrate of the optical material and subsequently deforming the mask material by heat treatment so that a surface area of said mask material be reduced; and

    transcribing the light converging means shaped in compliance with a shape of said mask material by dry etching on said substrate.

21. The method for preparing the optical device according to claim 20 wherein a temperature of the heat treatment is higher than a glass transition temperature of the

mask material and lower than a carbonizing temperature of the mask material.